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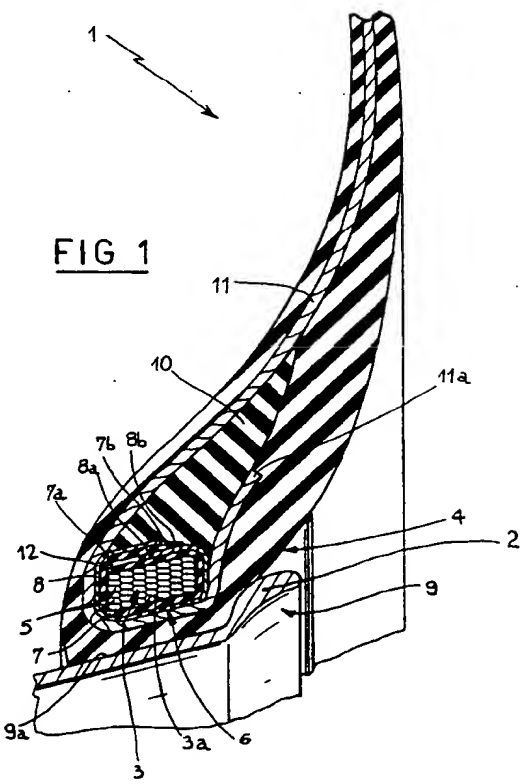
(54) Process to manufacture a tyre for vehicle wheels and tyre obtained thereby.

(57) In the manufacture of a tyre a covering structure (6) is previously associated with each bead core, which structure consists of a sheet (7) made of elastomeric material in a raw state wrapped around the bead core and a strip of rubberized fabric (8) in a raw state, reinforced with heat-shrinkable material cords, wound around the elastomeric material sheet (7). The bead cores (3) are subsequently assembled with other tyre components, and afterwards the tyre vulcanization step is carried out. During this step the chemical bonding between the elastomeric sheet (7) and the bead core (3) is achieved, which bonding is promoted by the simultaneous shrinkage of the cords provided in the rubberized fabric strip (8).

FIG 1



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The present invention relates to a process to manufacture a tyre for vehicle wheels and more particularly to a tyre designed to be mounted on heavy transport motor-vehicles.

Said tyre is provided with a carcass comprising two beads each defined along an inner circumferential edge of the tyre for securing it to a corresponding mounting rim, said carcass also comprises a pair of annular reinforcement cores, usually referred to as bead cores, each fitted in the corresponding bead, each bead core consisting of a plurality of coils of bare metal wire disposed in axial side by side relation and radially superposed, the coils being pack-wise joined together so as to form a transverse polygonal section, the bead core being then enclosed in a covering structure and being provided in a radially external position with a filling of elastomeric material extending along the outer circumferential edge of the bead core and radially tapering away from the tyre axis, said carcass being provided, in addition, with a supporting structure consisting of at least a ply of rubberized fabric reinforced with textile or metal cords, extending axially from one bead to the other and exhibiting its edges folded back about the bead cores and the fillings.

It is known that the engagement between a tyre and the respective rim is generally achieved by means of areas extending circumferentially within the tyre and generally referred to as "beads". Generally inserted in each tyre bead is a so-called "bead core" performing the double function of giving the appropriate non-deformability character to the bead when the tyre is being used and holding the end edges of the carcass ply or plies which are folded back around the bead core itself. Disposed along the outer circumferential edge of the bead core is an elastomeric filling of substantially triangular section, which has the function of stiffening the tyre bead and filling the space still empty between the carcass plies the the folded portions thereof, due to the bead core sizes.

Each bead core is formed with a plurality of wire coils usually of metal material, disposed in axial side by side relation and radially superposed so as to give the desired geometrical configuration to the bead core when seen in cross section.

In tubeless tyres, that is those devoid of the air tube, the bead, and specifically its reinforcement bead core, constitute a particularly critical element in the tyre.

In fact, due to the absence of the air tube, a rim of one piece construction, that is the so-called "grooved rim" is required, as well as an air-tight coupling between the tyre and the rim, for the purpose of maintaining the inflation pressure in the tyre.

As regards the rim, it is provided with bead-retaining flanges of reduced radial extension so that it is possible to carry out the mounting of the tyre on the rim and the dismantling therefrom by making the tyre bead override the retaining flange by means of a slight oval conformation given to the bead.

As regards the achievement of air-tightness between the tyre and the rim, the rim is provided with bead-supporting housings which are radially inclined towards the outside by an angle of 15° relative to the tyre axis; during the tyre inflation the inflation pressure urges the bead to slide axially towards the outside on said inclined surface of progressively increasing diameter and, since the reinforcement bead core is circumferentially inextensible by itself, as a result this sliding brings about a tight fit between the bead and the rim, so that the elastomeric material interposed between the bead core and the bead housing is compressed, being thereby achieved the air-tightness between the tyre and the rim.

However, for the achievement of this tight fit a bead core is necessary in which its surface facing the rim is substantially parallel to the bead housing, that is inclined by 15° too on the rotational axis of the tyre and axially extending over at least 50% of the axial extension of the bead itself.

In order to comply with this requirement, bead cores having a polygonal, rhomboidal or hexagonal right section have been since long provided and they consist of a pack of coils of bare metal wire, disposed in axial side by side relation and radially superposed, such as for example the bead core disclosed in the US Patent No. 3,949,800.

This type of bead core is very flexible since the coils of bare wire can be easily displaced relative to one another and therefore it can be easily made oval so that the assembling and disassembling of the tyre from the rim can be easily achieved.

On the other hand, however, these bead cores, due to the fact that they are made of coils of bare wire, have some serious drawbacks as compared with the usual bead cores made of rubberized wire, which drawbacks reduce the useful lifetime of the tyre.

First of all they have a weak shape stability and specifically weak torsional resistance so that during the moulding and vulcanization step of the tyre, under the thrust of the vulcanization pressure and the pulling action exerted by the carcass plies, their polygonal right section loses the starting geometrical form which is rigidly square and take a different form which is basically round in particular at the side facing the rim, thereby diminishing the amount of the axial extension and varying the inclination thereof relative to the predetermined one, that is 15°.

As a result of this deformation the tyre bead is unable to withstand the efforts to which it is submitted in us , for a long time: in particular, also due to the reduced height of the rim flange, the tyre bead in use begins to turn about its radially inner and axially outer edge thereby causing its cyclical detachment from the base resting on the rim, starting from the point and progressively going on over an increasingly greater portion as far as its structural strength is impaired.

A second drawback originates from the fact that the rubber/metal embonding on the bare metal, as in the case of the concerned bead core, is of difficult achievement and does not possess high mechanical features, so that, as time goes by, the breakage of the bonding interface can take place in the tyre in use and, as a result, the bead core can be separated from the bead, which involves the necessity of replacing the tyre within a short period of time.

In order to avoid the first drawback, that is the bead core deformation during the vulcanization step, in accordance with the known art the bare bead core is incorporated into a shell of elastomeric material and the half-vulcanization of the assembly is carried out before applying the filling and inserting the bead core in the carcass of the tyre being worked.

However while this half-vulcanization on the one hand exerts a sufficiently stiffening action on the bead core which is therefore capable of overcoming the tyre vulcanizing step without undergoing important deformations, on the other hand adversely affects not only the rubber/metal bonding between the shell and the bead core but also the rubber/rubber bonding between the half-vulcanized shell surface and the other bead elements still in a raw state, thereby further impairing a situation which is already critical in itself, for the above reasons.

These types of bonding are not even improved by the final vulcanization step, since the bonding interfaces have already reached the stabilization during the previous half-vulcanization step.

In particular, rubber in the raw state, as is known, has some adhesiveness. This adhesiveness is used for joining together the different rubber parts constituting the tyre, not only mechanically but also from a molecular point of view during the final vulcanization step. Unfortunately in this case the adhesiveness of the rubber shell covering the bead core is reduced sometimes even to zero, due to the preceding partial vulcanization step and therefore it is substantially reduced the capability of the rubber shell to be coupled with the elastomeric material filling and the other surrounding rubberized fabrics.

As a result, it is necessary to submit this rubber shell to a solutioning step, in order to give it back, at least partly, the adhesiveness features that it has lost during the partial vulcanization.

In order to obviate this requirement as much as possible, attempts have been made to improve this bonding, in accordance with the teachings contained in the British Patent No. 2,064,442 in the name of the same Applicant, consisting in covering the rubber shell with a layer of different rubber, optionally incorporating a reinforcement cord structure made of a heat-shrinkable material such as nylon having a different vulcanization rate. In particular, the rubber in the shell, that is that in contact with the bead core, has a higher vulcanization rate whereas that in the outer layer has a lower vulcanization rate. Therefore, when the covered bead core is submitted to the half-vulcanization step, the outermost layer substantially remains in a raw state and, as such, is capable of adhering to a greater extent to the surrounding rubber parts, which are in a raw state too, during the final vulcanization step.

Alternatively, in accordance with the teachings of the Italian Patent No. 1,151,359 in the name of the same Applicant, the shell has been replaced with a rubberized fabric strip reinforced with textile cords preferably of nylon; then a second rubberized fabric covering reinforced with cords made of heat-shrinkable material preferably consisting of a fabric strip coiled about the taped bead core is applied after the half-vulcanization. In this manner, when the tyre is submitted to the final vulcanization step the nylon cords of the second covering become shorter thereby exerting a strong pressure on the first covering and, as a result, the friction between the two concentric coverings brings about a chemical cooperation for the achievement of a sufficient degree of bonding.

On the other hand it is apparent that the shape stability and torsional strength of the bead core section is not at all increased.

These processes solve the problem connected with the rubber/rubber bonding at least partly but do not succeed in substantially improving the weak bonding created between the bead core metal and its shell during the half-vulcanization step.

As regards the increase of the torsional strength of the metal bead core in itself, sections of the wire (some of which are disclosed in the above mentioned US Patent) have been studied that interact with one another so as to make the right bead core section steadier.

In this connection the Applicant itself has recently offered a brilliant solution to the problem, in accordance with the US Patent No. 5,007,471 by providing a bead core in which coils made of wire having a hexagonal flattened right section are mutually fitted in coils disposed in side by side relation therewith, with a half-coil staggering, thereby

forming a pack-wise section that is practically not-deformable both in the axial and radial direction, which will ensure the bead core a very high transverse stability and torsional strength.

In greater detail, in a free tyre, that is during the assembling and disassembling step of the tyre with and from the rim, the coils can move with respect to one another giving a high flexibility and deformability to the bead core whereas under the effect of the inflation pressure, that is when the coils are in tension, the bead core becomes stiff, thereby acquiring a practically not-deformable right section.

In accordance with the present invention a stronger tyre is achieved in connection with a better adhesion between the bead core metal and the elastomeric material rubber covering it, as well as between the rubber forming said covering and the other rubber parts forming the tyre bead.

The present invention relates to a process to manufacture a tyre for vehicle wheels said tyre being provided with a carcass comprising two beads each defined along an inner circumferential edge of the tyre for anchoring the tyre to a corresponding mounting rim, said carcass also comprising a pair of annular reinforcement cores, referred to as bead cores, which are circumferentially inextensible and each of which is inserted in the corresponding bead, each bead core consisting of a plurality of coils made of bare metal wire disposed axially in side by side relation and radially superposed, said coils being gathered pack-wise so as to form a polygonal transverse section, said bead core being held in a covering structure and being provided, at a radially external position, with a filling of elastomeric material, characterized in that it comprises the following steps:

- loop-wise covering said metal bead core (3) with a sheet (7) of elastomeric material in a raw state;
- covering said sheet (7) of elastomeric material with a strip of rubberized fabric (8) in a raw state, reinforced with cords (12) of heat-shrinkable material oriented in an oblique direction relative to the circumferential extension of the bead core;
- applying said filling (10) to said covered bead core, along the outer circumferential edge thereof;
- associating said bead core and respective filling with the structure of a tyre being manufactured;
- vulcanizing said tyre in an appropriate mould by a heat process involving application of pressure and heat, so that said cords (12) of heat-shrinkable material, shrinking by effect of heat, may exert a compressive action on said sheet (7) of elastomeric material in a raw state during the creation of the rubber/metal bonding interface between said coils of bare metal wire and said sheet of elastomeric material.

In accordance with the present invention, by this process a tyre for vehicle wheels is achieved which is provided with a carcass comprising two beads each defined along an inner circumferential edge of the tyre for anchoring the tyre to a corresponding mounting rim, said carcass also comprising a pair of annular reinforcement cores, referred to as bead cores, which are circumferentially inextensible and each of which is inserted in the corresponding bead, each bead core consisting of a number of coils of bare metal wire disposed in axial side by side relation and radially superposed, said coils being gathered pack-wise so as to form a polygonal transverse section and said bead core being held in a covering structure,
characterized in that said covering structure exclusively comprises:

- a sheet of elastomeric material loop-wise wound about said pack of metal coils; and
- a strip of rubberized fabric reinforced with cords of heat-shrinkable material wrapped around said sheet of elastomeric material.

Further features and advantages will become more apparent from the detailed description of a preferred embodiment of a tyre carcass for motor-vehicles, in accordance with the present invention, given hereinafter by way of non-limiting example with reference to the accompanying drawings, in which:

- Fig. 1 is a cross-section of the area concerned with one of the tyre beads, the other bead being substantially identical and symmetrical with respect to the bead shown;
- Fig. 2 is a cross-section of the bead core covering structure in a convenient pre-assembling form before being wrapped around the bead core. It is noted that the remaining tyre parts have not been shown as they are conventional and at all events not of importance to the ends of the invention.

Referring to the drawing, the radially internal portion of the sidewall of a tyre for vehicle wheels in accordance with the present invention has been generally identified by 1. The tyre carcass comprises a pair of bead cores 3 (only one of them is shown), each fitted in a bead 4 defined along the inner circumferential edge of the tyre. It is at each bead 4 that the engagement of the tyre by the mounting rim 9 occurs.

Each bead core 3 consists of a number of metal wire coils 5 disposed in axial side by side

relation and radially superposed. In the embodiment shown in which the bead core 3 is associated with a tubeless tyre, the coils 5 are disposed so as to form a rhomboid-shaped transverse section. Said section has a base side 3a parallel to the bead supporting seat 9a on the rim 9. In this type of tyres the base side 3a and the rim surface 9a are substantially inclined by 15° relative to the tyre axis and the length of side 3a (that is the bead core width) is at least 50% of the axial width of the base of the bead in which the bead core is located.

The bead seat 9a terminates, at an axially external position, in a flange 2 extending radially towards the outside little beyond the maximum diameter of the bead core side 3a, that is by an amount sufficient to keep the bead in place in its seat when the tyre is inflated but that does not hinder the assembling and disassembling of the tyre on and from the rim, as above said.

Preferably the individual coils 5 have a flattened hexagonal transverse section which is capable of giving a high flexibility to the bead core when the tyre is dismantled and at the same time a high shape stability and torsional strength to the tyre in use.

It is clear that the sizes of said flattened hexagonal section must be determined (which on the other hand is in accordance with the present state of the art) so that the axial interconnection between coils disposed in side by side relation can give rise to an inclination of the side 3a on the bead core axis equal to the required 15° value.

Each bead core 3 is enclosed in an elastomeric covering structure 6. The covering structure 6 is comprised of a sheet 7 made of elastomeric material of uniform thickness, loop-wise wrapped around the bead core 3, and a strip 8 of rubberized fabric, reinforced with cords 12 of heat-shrinkable material (only one of which is shown in the drawing), which may be either loop-wise wrapped or coiled around the corresponding sheet 7. When the strip 8 is loop-wise wrapped around the sheet 7, it is convenient to carry out the pre-assembling of the sheet 7 and strip 8 (Fig. 2) so that the bead covering may be performed by a single looping operation. In this case it is preferable that the two elements should be assembled with a nitch provided at least at a pair of corresponding edges (7a, 8a), preferably both pairs (that is also 7b, 8b) as shown in Fig. 2, although the solution without a nitch or offset can also be used.

The bead core is then covered by causing the mutual overlapping of the sheet ends (7b upon 7a) over the portion corresponding to the offset width 7a-8a, so as to be sure that the sheet 7 completely incorporates the metal coils 5 avoiding the risk of displacements between th facing sheet ends, which would leave a free space and the possibility of contact between the metal coils 5 and the rubberized fabric 8.

At the same time also the strip 8 ends are mutually overlapped (8b upon 8a) so that the risk of displacement between the fabric borders, which would be prejudicial to the effect of the invention as hereinafter explained, is reduced to zero.

Preferably the width of the offset 7a-8a will be about 16 mm, as well as that of the offset 7b-8b, whereas the width of staggering between the ends 8a and 8b of the rubberized fabric 8 will preferably be in the range of 5 mm to 15 mm. In addition, the strip 8 and sheet 7 will be preferably overlapped along the outer circumferential edge of the bead core 3.

It is to be noted that in Fig. 1 the covering structure 6 has been shown so as to highlight the above described arrangement of the sheet and strip edges 7a, 7b, 8a, 8b. Actually, in the finished tyre the edges 7a and 7b will form a unitary body together with the elastomeric material present in the strip 8.

The physical and size features of the sheet 7 and strip 8 can vary depending upon the type of motor-vehicle for which the tyre is designed, as well as upon the operating features to be given to the tyre itself.

In particular, the thickness of the elastomeric material sheet will conveniently be in the range of 0.5 mm to 3 mm, these values respectively representing the minimum value to ensure a complete and efficient rubberizing of the outer bead core surface and the maximum permissible value to hold the thickness of the elastomeric material layer which is enclosed (and compressed in use) between the bead core base 3a and the rim surface 9a within correct values, in accordance with the assembling requirements.

As regards the rheometric features, the absolute viscosity (Mooney) of the elastomeric material compound of the sheet 7 in a raw state will conveniently be in the range of 80 to 110, that is higher than that of the strip 8 rubberizing compound that will be included between 50 and 80, the differential between the respective values preferably ranging between 25 and 50 Mooney units.

On the contrary, as regards the strip 8 cords, they are preferably made of nylon and disposed in the fabric as closely as possible with respect to their size. Practically it is convenient to speak of a "filling coefficient" of the fabric, expressed as the percent ratio between the available space and the space actually taken up by the bare (that is not rubberized) cords, the value of which will conveniently be between 30% and 90%, preferably between 50% and 80%.

The fabric sheath 8 must in fact behave like a closed container decreasing in volume during the

vulcanization step that does not let the sheet 7 compound penetrate from the outside between two cords disposed alongside each other. The cords are then disposed transversely to the circumferential direction of the bead core, substantially parallel to the tyre axis when the fabric is helically coiled on the bead core, inclined preferably by an angle in the range of 40° to 50° when the fabric sheath is loop-wise wrapped.

As regards the coiling of the fabric sheath 8 on the bead core the relevant technology is well known and does not deserve a detailed description. It will be sufficient to remember that a cord, or tape comprised of two or more cords, disposed in a longitudinal direction to the tape, is coiled circumferentially about the bead core, around which the sheet 7 has already been loop-wise wrapped, the ends of which are overlapped as already discussed.

Extending along the outer circumferential edge of each of the bead cores 3 is an elastomeric filling 10, radially tapering away from the tyre axis.

In known manner, extending over the whole section of the tyre is at least a carcass ply 11 the edges 11a of which are folded back around the bead cores 3 and fillings 10.

In an original manner, in accordance with the invention, the process for the manufacture of the above described tyre is as follows.

First of all the sheet 7 of elastomeric material in a raw state is loop-wise wrapped around each of the bead cores 3. Then the sheet of elastomeric material 7 is covered with the strip 8 of rubberized fabric in a raw state, reinforced with nylon cords.

As previously said, the strip 8 can be coiled around the sheet 7 or loop-wise wrapped thereabout. In the case in which, as in the drawing, the strip 8 is loop-wise wrapped, it is convenient to join the sheet 7 and strip 8 together before their wrapping around the bead core 3. In this manner it is possible to cover the bead core by a single step. In a preferred embodiment the sheet 7 and strip 8 can be coupled so that the respective longitudinal edges are staggered parallelly to each other. In this manner the respective longitudinal edges 7a and 7b, 8a and 8b of the sheet 7 and strip 8 are overlapped as previously described and illustrated in the accompanying drawings.

After the bead core 3 has been covered, the filling 10 is applied to the outer circumferential edge thereof.

The subsequent step consists in associating the bead cores 3 with the tyre carcass, each core being provided with the respective covering structure and filling 10.

Finally, the tyre is vulcanized in an appropriate vulcanization mould, operated by a corresponding press through a heat process characterized by accurate temperature and pressure values and by an exact stay time of the tyre in the mould, all that in known manner and therefore not described in detail; it will be sufficient to remember that a vulcanization step for giant tyres of the type of the invention generally needs a pressure of about 20 bar and a temperature in the range of 130° to 150°, applied for a period of 45 to 60 minutes.

During the last mentioned step the cords of the heat-shrinkable material, due to the absorbed heat, become shorter causing the reduction in volume of the enclosure defined by them and consequently they exert a high pressure on the elastomeric material of the sheet 7, which represents an overpressure relative to the pressure exerted on the carcass by the vulcanization fluid acting within the carcass itself, or better within the vulcanization bag, in turn inserted in the carcass to be vulcanized. In accordance with the present invention the action exerted by this overpressure, in combination with the high specific temperature, pressure, and duration time values of the vulcanization cycle has been found to be very efficient to the ends of the achievement of an optimal chemical bonding between the metallic bead core 3 surface and the inner surface of the sheet 7 of elastomeric material, both because it is an overpressure relative to the normal pressure used in vulcanization, and because the sheet 7 wrapped around the bead core 3 is still in a raw state and not half-vulcanized, as it happened in the processes of the known art. And exactly for the above reasons the one and only pressure that may be exerted by a fabric covering having heat-shrinkable cords during a half-vulcanization step is inefficient for the purpose of achieving a high rubber/metal bonding value.

Obviously also the rubber present in the strip 8, since it is in a raw state, will perfectly adhere to the compound of the sheet 7 and filler 10 and to the other rubber parts belonging to the tyre carcass thereby accomplishing an excellent rubber/rubber bonding.

The present invention attains the intended purposes.

In fact, by virtue of the excellent chemical bonding that has been created between the bead core 3 and sheet 7, possible detachments between the bead core and the rubber incorporating it are practically eliminated in a tyre in use, which brings about an increase in the tyre lifetime, particularly as regards the possibility of retreading it. Obviously the more the cross-section of the bead core is torsionally resistant and permanently of steady shape, the more the invention is advantageous, since the reduced thickness of the elastomeric material sheet, differently from the case of the half-vulcanized shells having a great thickness, is not capable of efficiently compensating for any exces-

sive deformability of the bead core section during the vulcanization step.

Obviously modifications and variations can be made to the invention as conceived, all of them falling within the scope of the inventive idea.

Claims

1. A process to produce a tyre for vehicle wheels said tyre being provided with a carcass comprising two beads each defined along an inner circumferential edge of the tyre for anchoring the tyre to a corresponding mounting rim, said carcass also comprising a pair of annular reinforcement cores, referred to as bead cores, which are circumferentially inextensible and each of which is inserted in the corresponding bead, each bead core consisting of a plurality of coils made of bare metal wire disposed axially in side by side relation and radially superposed, said coils being put together pack-wise so as to form a polygonal transverse section, said bead core being held in a covering structure and being provided, at a radially external position, with a filling of elastomeric material, characterized in that it comprises the following steps:
   - loop-wise covering said metal bead core (3) with a sheet (7) of elastomeric material in a raw state;
   - covering said sheet (7) of elastomeric material with a strip of rubberized fabric (8) in a raw state, reinforced with cords (12) of heat-shrinkable material oriented in an oblique direction relative to the circumferential extension of the bead core;
   - applying said filling (10) to said covered bead core, along the outer circumferential edge thereof;
   - associating said bead core and respective filling with the structure of a tyre being manufactured;
   - vulcanizing said tyre in an appropriate mould by a heat process involving application of pressure and heat, so that said cords (12) of heat-shrinkable material, shrinking by effect of heat, may exert a compressive action on said sheet (7) of elastomeric material in a raw state during the creation of the rubber/metal bonding interface between said coils of bare metal wire and said sheet of elastomeric material.

2. A process according to claim 1, characterized in that befor the bead core covering step, the execution of a step for associating the elastomeric material sheet (7) with the rubberized fabric strip (8) is provided.

3. A process according to claim 2, characterized in that a first and a second longitudinal edges (7a, 7b) of the elastomeric material sheet (7) are parallelly offset relative to a corresponding first and second longitudinal edges (8a, 8b) of the rubberized fabric strip (8).

4. A process according to claim 3, characterized in that said first and second edges (7a, 7b; 8a, 8b) of the sheet (7) and strip (8) respectively, are mutually overlapped along the outer circumferential edge of the bead core (3), on which said filling (10) is afterwards disposed.

5. A tyre for vehicle wheels provided with a carcass comprising two beads each defined along an inner circumferential edge of the tyre for anchoring the tyre to a corresponding mounting rim, said carcass also comprising a pair of annular reinforcement cores, referred to as bead cores, which are circumferentially inextensible and each of which is inserted in the corresponding bead, each bead core consisting of a number of coils of bare metal wire disposed in axial side by side relation and radially superposed, said coils being gathered pack-wise so as to form a polygonal transverse section and said bead core being held in a covering structure, characterized in that said covering structure exclusively comprises:
   - a sheet of elastomeric material loop-wise wound about said pack of metal coils; and
   - a strip of rubberized fabric reinforced with cords of heat-shrinkable material wrapped around said sheet of elastomeric material.

6. A tyre according to claim 5, characterized in that the transverse section of each said coil (5) is of hexagonal flattened form.

7. A tyre according to claim 5, characterized in that the thickness of said elastomeric material sheet (7) is in the range of 0.5 mm to 3 mm.

8. A tyre according to claim 5, characterized in that the strip (8) of rubberized fabric is loop-wise wrapped around the respective sheet (7) of elastomeric material, the overlap width between the corresponding edges (8a, 8b) of said strip being included between 5 mm and 15 mm.

9. A tyre according to claim 5, characterized in

that the absolute viscosity (Mooney) of the elastomeric material compound of the sheet (7) in a raw state is in the range of 80 to 110, whereas that of the rubberizing compound of the rubberized fabric of the strip (8) in a raw state is in the range of 50 to 80.

10. A tyre according to claim 9, characterized in that the difference in the absolute viscosity between the compound of the elastomeric material sheet (7) in a raw state and that of the compound of the rubberized fabric of the strip (8) in a raw state is included between 25 and 50.

FIG 1

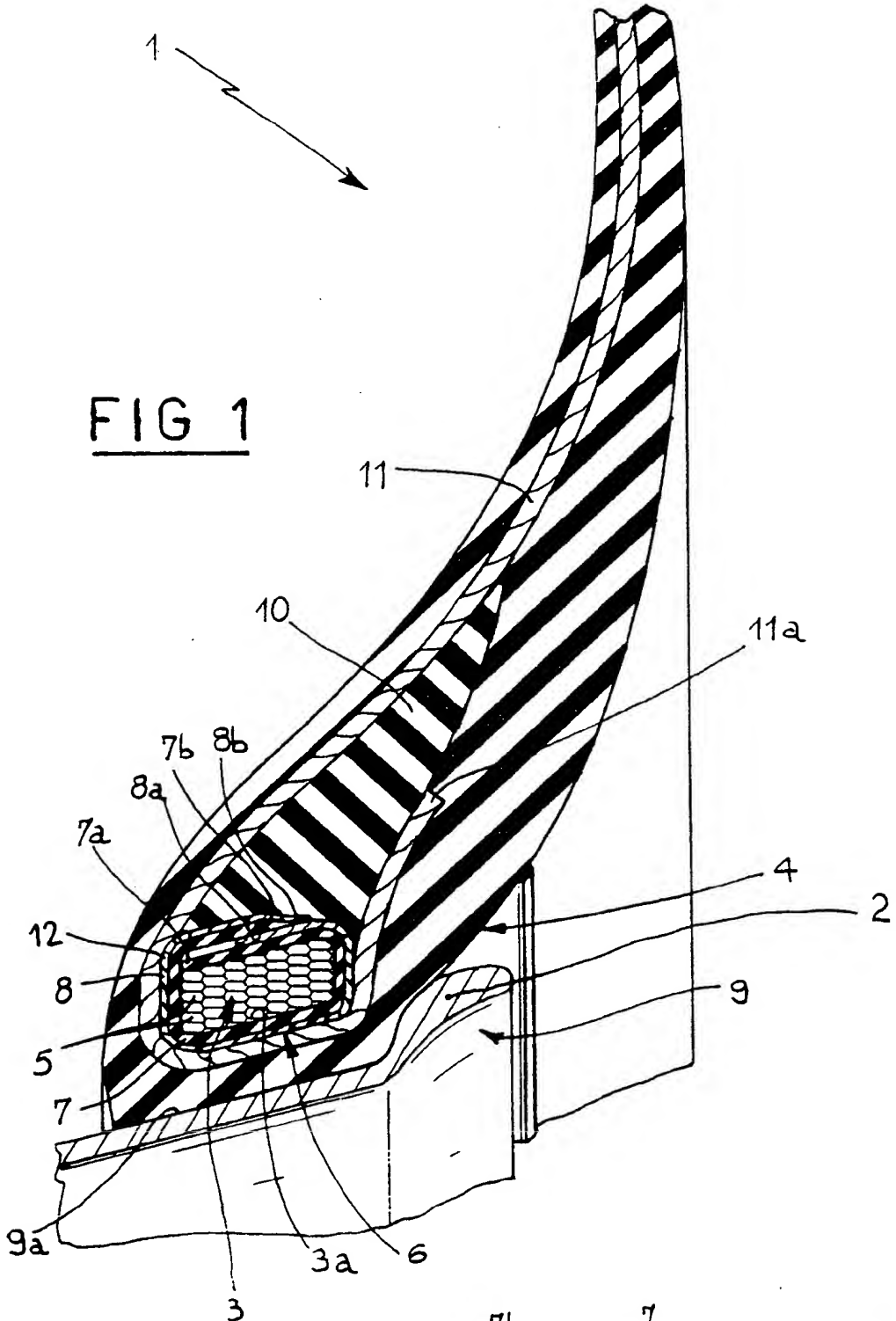
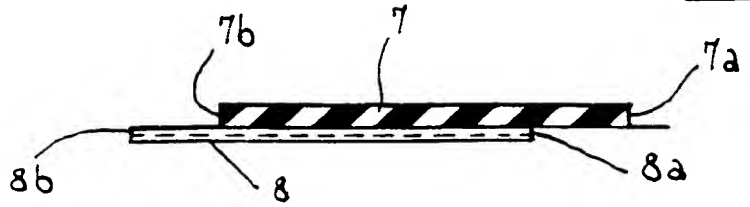


FIG 2



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EUROPEAN SEARCH REPORT

Application Number

EP 91 12 1948

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	EP-A-0 251 980 (GOODYEAR) * the whole document *	1,2,5-7, 9,10	B29D30/48 B60C15/06
D,Y	GB-A-2 064 442 (PIRELLI) * the whole document * & IT-A-1 124 863 (PIRELLI)	1,2,5-7, 9,10	
A	US-A-3 106 952 (W.H.RUDDER) * the whole document *	1,5	
D,A	US-A-3 949 800 (LEJEUNE) * the whole document *	1,5	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B29D
B60C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 MARCH 1992	SUENDERMANN R.O.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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